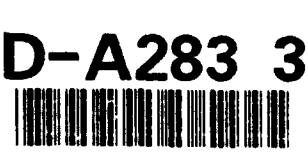


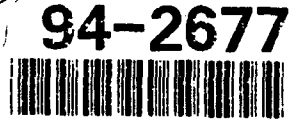
ADST/WDL/TR-93-003064

ADST
Software Maintenance Manual
for the
AIRNET
Digital Message Communications Console

Loral Western Development Labs
Electronic Defense Systems Software Department
Software Engineering Laboratory
3200 Zanker Road
San Jose, California 95161-9041

March 31, 1993

Contract No. N61339-91-D-0001
CDRL A005



Prepared for

Simulation Training and Instrumentation Command
Naval Training Systems Center
12350 Research Parkway
Orlando, FL 32826-3275

LORAL

REPORT DOCUMENTATION PAGE

Form approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	31 MARCH 1993	Version 1

4. TITLE AND SUBTITLE
ADST MAINTENANCE MANUAL
AIRNET Digital Message Communications Console

5. FUNDING NUMBERS
Contract No. N61339-91-D-0001

6. AUTHOR(S)
Aiken, John, Desmeules, Peter

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Loral Systems Company
ADST Program Office
12443 Research Parkway, Suite 303
Orlando, FL 32826

8. PERFORMING ORGANIZATION REPORT NUMBER
ADST/WDL/TR-92-003064

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Simulation, Training and Instrumentation Command
STRICOM
Naval Training Systems Center
12350 Research Parkway
Orlando, FL 32826-3275

10. SPONSORING ORGANIZATION REPORT

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Final version for public release.

12b. DISTRIBUTION CODE
A

13. ABSTRACT (Maximum 200 words)

The Maintenance Manual for the AIRNET Digital Message Communications Console describes the end user Maintenance procedures for the AIRNET DMCC Software.

14. SUBJECT TERMS

15. NUMBER OF PAGES
18

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	17. SECURITY CLASSIFICATION OF THIS PAGE	17. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std Z39-18
298-102

Table of Contents

LIST of FIGURES

LIST of TABLES

1 Introduction

1.1 Scope.

This document is provided to help a software developer get an overview of the DMCC System and it's software design.

1.2 Purpose.

The purpose of this document is to describe the software of the AIRNET Digital Message Communications Console, so as to allow maintenance.

The remainder of this document is organized as follows:

- Section 1.3, Referenced Documents, identifies all of the documents that are included in this document by reference or that provide additional information to describe the DMCC software or hardware architecture.

- Section 2, Overview, includes an architectural overview of the DMCC System and an overview of the hardware interfaces.

- Section 3, Hardware Configuration, describes the hardware and communications interfaces involved with the DMCC system.

- Section 4, Software Configuration describes the software that resides on each piece of hardware on the DMCC system.

1.3 Referenced documents.

The following documents are referenced in this document or provide supplementary information useful in understanding the software structure of the DMCC system.

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

1.3.1. Government documents.

1.3.1.1 Specifications:

None.

1.3.1.2 Standards:

DI-MISC-80711 Scientific and Technical Reports

IST-CR-92-12

Military Standard: Draft DIS 2.0: Protocol Data Units for Entity Information and Entity Interaction in a Distributed Interactive Simulation, Institute for Simulation and Training, 12424 Research Parkway, Suite 300, Orlando, Florida, September 4, 1992

1.3.2 Non-Government documents.

Rotary Wing Aircraft AIRNET Aeromodel and Weapons Model Conversion Statement of Work, April 6, 1992.

Software Requirements & Interface Specification for the AIRNET MCC Comanche Support and Digital Message/Communications Upgrade, Loral Western Development Labs, 3200 Zanker Road, POBox 49041, San Jose, California.

System Specification for the RWA AIRNET Aeromodel and Weapons Conversion, LORAL Western Development Labs, 3200 Zanker Road, POBox 49041, San Jose, California, WDL/TR--92-003011, June 5, 1992.

Software Design Document for the AIRNET Digital Message Communications Console, Volume III, Loral Western Development Labs, 3200 Zanker Road, San Jose, California, ADST/SDL/TR--93-003036, February 19,1993.

Operations Manual for the AIRNET Digital Message Communications Console, Loral Western Development Labs, 3200 Zanker Road, San Jose, California, ADST/WDL/TR--93-003054, Febrary 12, 1993.

The X Window System: Programming and Applications with Xt, OSF/Motif® edition, Douglas A. Young, Hewlett-Packard Laboratories, Palo Alto, California, Prentice Hall, Englewood Cliffs, New Jersey, 1990

The Motif® Programming Manual for OSF/Motif version 1.1, volumes 1 - 6, (The Definitive Guides to the X-Window System) Dan Heller, O'Reilly & Associates, Inc., July 1992.

OSF/Motif® Programmer's Reference, Release 1.1, Open Software Foundation, Prentice Hall, Englewood Cliffs, New Jersey 1991

Builders Xcessory User's Guide, Version 2.0, Integrated Computer Solutions, Incorporated, 201 Broadway, Cambridge, Massachusetts, 1991.

The SIMNET Network and Protocols, BBN Report No. 7627, June 1991,

Prepared by:	Prepared for:
BBN Systems and Technologies	DARPA
10 Moulton Street	Information&Science Technology Office
Cambridge,	1400 Wilson Boulevard
Massachusetts 02138	Arlington, Virginia 22209-2308

Internet Protocol. DARPA Internet Program. Protocol Specification
September 1981.

Prepared by:	Prepared for:
Information Science Institute	DARPA
USC	Info. Processing Techniques Office
4676 Admiralty Way	1400 Wilson Boulevard
Marina del Rey, CA 90291	Arlington, Virginia 22209

Interface Control Document(ICD) for the BDS-D Network Interface,
14 February 1992(Last updated 21-Feb-92 17:58)

SIMNET Long Haul Network(LHN) Gateway Operations and Maintenance,
ENCL 5

A Standard for the Transmission of IP Datagram over IEEE 802 Networks
(Internet and Address Resolution Protocol on IEEE 802 Networks)
Network Working Group, Request for comments(RFC): 1042
J. Postel and J. Reynolds, ISI, February 1988.

2 Overview

2.1. System overview.

The AIRNET system is a network of simulators to help teach Army aviation crews and battlefield support personnel to fight in a combined arms battlefield environment.

The AIRNET Digital Message Communications Console (DMCC) provides for pre-formatted and free text digital messaging capability between simulation entities internal and external to the AIRNET network.

The DMCC software is a multi-threaded, X-windows client server application suite.

The DMCC software contains a custom protocol for communications in the context of the SIMNET and Draft DIS 2.0 distributed simulation protocols. This protocol is fully interoperable across the SIMNET/DIS 2.0 Protocol Translator Gateway.

The DMCC uses a graphical user interface to emulate vehicle crew station soldier machine interfaces.

The Digital Message Communications Console allows transmission, reception, and storage of, and access to, simulated pre-formatted and free text tactical messages between ground support, Tactical Operations Centers, Fire Support Elements, and manned vehicle simulators, via the SIMNET and DIS simulation networks.

The DMCC software is platformed on a Sun Microsystems Sparc-10 workstation running SunOS, Sun Microsystems Software's implementation of the UNIX operating system. The runtime environment includes Version 11 of the X-Windows windowing system and OSF Motif version 1.1 graphical user interface.

Up to 8 X-terminals may be connected to the workstation via the DMCC dedicated Ethernet local area network. Multiple DMCC client executables may be operational concurrently under the X client/server model.

DMCC client processes run on the Sun hardware. "Local client" operation is not used in this implementation.

The following diagram shows the top-level architecture of the Digital Message Communications System.

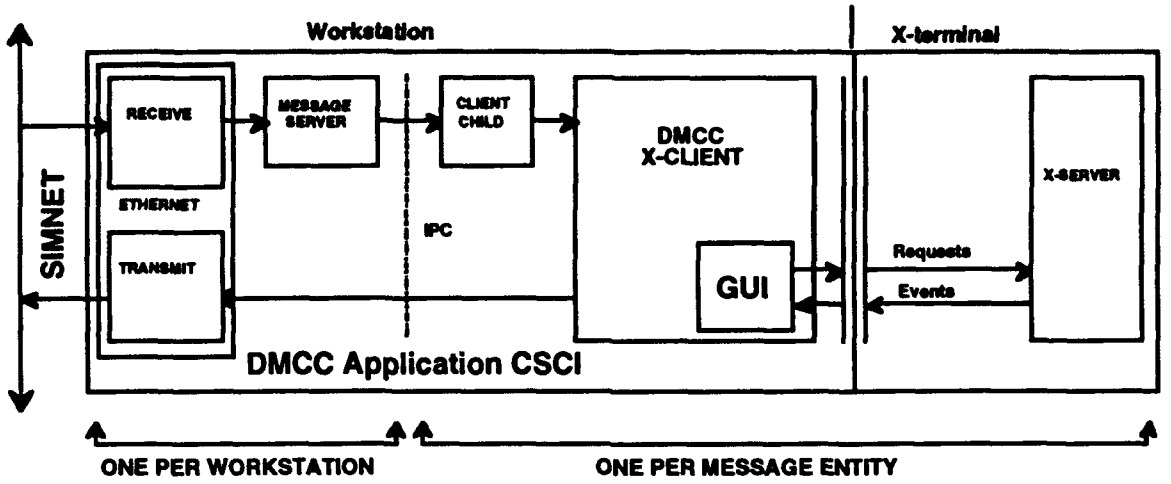


Figure 1 DMCS Software Architecture

The following figure details the nature of the instantiated-client configuration in the context of a X-terminal client server environment:

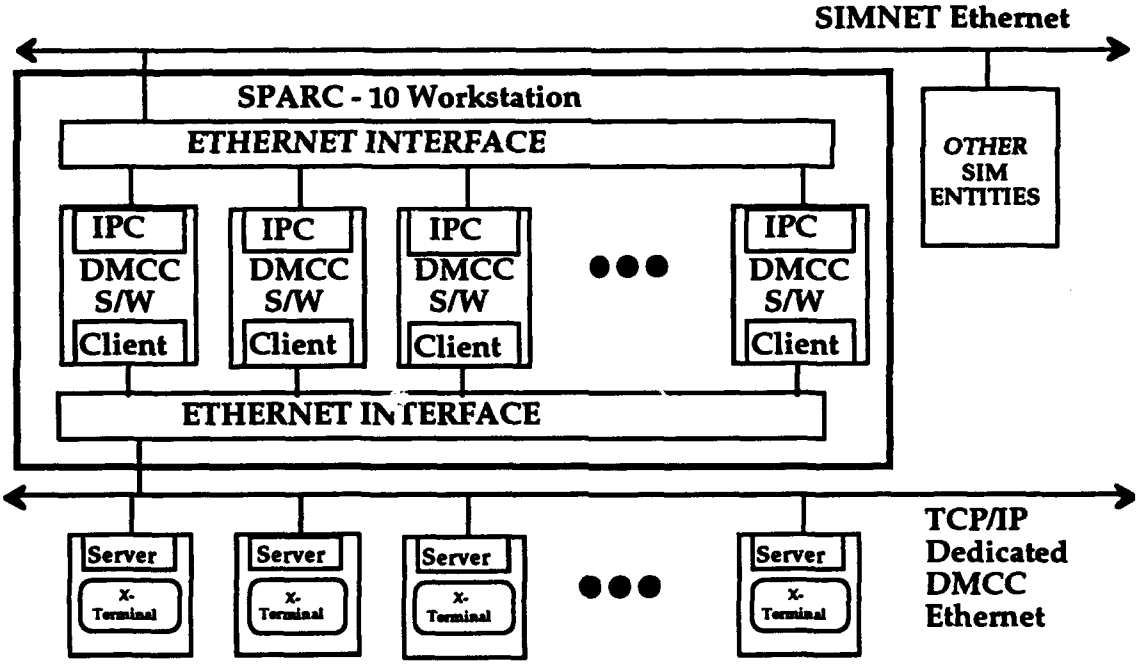


Figure 2 DMCC X-windows Client Server Environment

2.2 Interfaces

The DMCC utilizes two Ethernet interfaces, one for connecting to Simnet and another for communication between the Sparc-10 workstation and the X-terminal DMCC consoles. Refer to section 3.1.2.1 for more detail.

3 Hardware Configuration

3.1 Hardware Description

The DMCC is platformed on a Sun Microsystems SPARC-10 workstation, and utilizes X-terminals in a client-server environment for user interface.

3.1.1 CPU Configuration

3.1.1.1 DMCC Workstation

The DMCC Console is platformed on a Sun Microsystems Sparc-10 workstation in the following configuration.

Table 1, DMCC Workstation Hardware

Item	Quantity	Product Number	Description
1	1	S10MX-30-32-P43	SPARCstation 10 Desktop Workstation, Model 30 with One SuperSPARC Processor, GX Accelerated Greyscale Graphics, 19 inch Grayscale Monitor, 32 Megabytes of Memory, 424 Megabyte Internal CSCI Disk, Speakerbox, 1.44 Megabyte 3.5 inch Internal Floppy Disk Drive
2	1	X3450	SunOS Unix
3	1	X453A	SBus Ethernet Controller
4	1	SYSL20	Twenty-User Right-to-Use License for SunOS on Sun Systems
5	1	SX-21	SunOS Software, CD-ROM, All SPARCsystems
6	1	X559A	644 Megabyte Desktop SunCD Pack
7	1	X660A	150 Megabyte 1/4 Tape Desktop Backup Pack
8	1	X1053A	Fast SCSI Ethernet Board

3.1.2 Computer Peripherals

3.1.2.1 X-terminals

The 8 X-terminals are Wyse Model WYSE WY-X5 terminals with the following features:

Table 2, DMCC X-Terminal Hardware

Item	Quantity	Product Number	Description
1	8	WYSE WY-X5	WYSE X-terminal, 1280 x 1024 pixel screen resolution, 1 Megabyte standard memory
2	8	105 key ANSI	Keyboard
3	8	X453A	SBus Ethernet Controller
4	8	4xMC2 Si-80	Four megabytes of add-on memory, 80 nanosecond access time

Commercial-off-the-shelf software which is downloaded into the x-terminals from the Sparcstation includes the X-server and screen fonts:

```
/tfpboot/wyX5                          -- Wyse server
/usr/lib/X11/wyse/fonts/*              -- fonts
```

Refer to the X-terminal manuals and the XDM online "man" pages for further description of these items.

3.1.2.2 DMCC Ethernet Interfaces

The DMCC uses 2 Ethernet interfaces for interface to Simnet and for interface to the dedicated DMCC X-terminals. One Ethernet interface is standard with the Sparc-10, and the other is a Sun Microsystems X1053A Fast SCSI/Ethernet adapter card. The ethernet controller is a Sun Microsystems Model X453A SBus Ethernet Controller.

The DMCC interacts with the SIMNET Ethernet Network Interface. The SIMNET interface receives PDUs from Ethernet in promiscuous mode and sends PDUs to Ethernet with a broadcast address.

Two Ethernet Network Interface cards are available on a Sparc-10 station. The DMCC can choose either one to be the SIMNET Network Interface. For a Sparc-10 workstation, Network Interface "le0" is generally the internal Network Interface that resides on the Motherboard and "le1" is the add-on Network Interface card.

3.1.2.3 Disk Drives

The Sparc-10 is configured with a built-in 32 Megabyte disk drive and a built-in 1.44 Megabyte 3.25 inch floppy disk drive.

For the DMCC installation, an additional R-Squared 520 Megabyte external disk drive, and a Sun Microsystems Model X599A CD ROM player are required.

3.1.2.4 Tape Drive

The DMCC includes a 150 Megabyte 1/4 inch Tape Drive for distribution of software and for backups.

3.1.3 Custom Hardware

There is no custom-built hardware in the DMCC system.

3.1.4 Hardware to Software Interfaces

The DMCC uses standard Sun Workstation software/hardware Ethernet and SCSI Interfaces.

4 Software Configuration

4.1 DMCC Software Description

The DMCC software is a multi-threaded, X-windows client server application suite.

4.1.1 Overview of DMCC Software

For a detailed description of the DMCC software design, refer to the DMCC Software Design Document, Document ADST/WDL/TR--93-003036 February 19, 1993, Volume III, ADST AIRNET Digital Message Communications Console (CSCI)

4.1.2 Development Environment Description

4.1.2.1 Development Environment Directory Structure

There are five types of concurrent executeables in the DMCC software suite. Please refer to the DMCC Software Design Document for a detailed description of the functions of and interfaces between these executeables.

Refer to section 4.1.3.5 of this document for a discription of the ownership and privilidges for the DMCC development environment directory structure.

The following is a list of the directories containing the source, object, and excutable files:

1. ./dmcc/netif - network interface source files
2. ./dmcc/DMS - message server source files
3. ./dmcc/GUI/source - X-window source files
4. ./dmcc/GUI/include - X-window include files
5. ./dmcc/GUI/bin - X-window object files
6. ./dmcc/pdu_decoders - pdu decoder source files
7. ./dmcc/include - DMS, netif, and pdu_decode include files
8. ./dmcc/object - DMS, netif, and pdu_decode object files
9. ./dmcc/bin - executables

Each source directory has a makefile, except the X-window application, which is in ./dmcc/GUI.

4.1.2.2 Development Environment Build Configuration

To build DMCC, change directory to dmcc/ and run the file 'buildit' with the following command:
(This command forces a complete recompile and relink of all files)

```
buildit clean >& buildit.log &
```

This runs the command in the background and writes informational and error messages
to the file buildit.log.

To only update DMCC, execute the following command:
(This command will only compile and link out-of-date files)

```
buildit >& buildit.log &
```

The output from the build procedure are as follows:
Buildit creates the following log files for each makefile (where $date in the filename is today's date, month and day):

DMS.$date
netif.$date
pdu_decode.$date
gui.$date

Object files for DMS, dmcc_sim_tx, dmcc_sim_rx, and pdu_decode routines are placed in dmcc/object. Object files for dmcc(the X-window application) are placed in dmcc/gui/bin.
All executables are placed in dmcc/bin. The executables are:

DMS	(message server)
dmcc_sim_tx	(network interface program - receive PDUs from SIMNET)
dmcc_sim_rx	(network interface program - transmit PDUs to SIMNET)
dmcc	(X-window operator interface program)
pdu_decode	(display files containing pdu's)

To determine if there were any errors during the build procedure, you must look in all output log files.

4.1.3 Runtime Environment Description

The DMCC host software resides entirely on the SPARC-10 workstation. "Local client" operation, where client executables are resident inside the x-terms, is not used.

4.1.3.1 Runtime Environment Directory Structure

The DMCC home directory is called ~dmcc; all applications in DMCC are contained in the subdirectory ~dmcc/bin. The name ~dmcc is automatically created when the System Administrator creates the dmcc account in the system password file, and then creates the home directory for dmcc. This directory can be anywhere in the file system. Root should own all files, with all executables and script files executable by 'others'.

4.1.3.2 Runtime Environment Data Files

The DMCC CSCI uses one external data file which contains an integer. This integer expresses the difference in minutes between Local Time and Zulu Time.

Name:

"/tmp/dmcc_timezone_offset"

Format:

Contains a single integer value

Location:

Maintained in DMCC temporary files directory: /tmp

Description:

The dmcc_timezone_offset file is a block oriented file containing a single integer. The contents of the file are ASCII readable. The value represents the number of minutes that Local Time is ahead of Greenwich Mean Time (GMT) (that is, the number of minutes to be subtracted from Local Time to obtain GMT); if the value is negative, then the value represents the number of minutes Local Time is behind GMT.

GMT (Greenwich Mean Time) is the same as ZULU.

4.1.3.3 Runtime Environment Command Arguments

There are no runtime CLI commands in the DMCC software.

4.1.3.4 Runtime User Interface Commands

The DMCC uses an OSF Motif® Graphical User Interface which runs in an X-Windows windowing environment. User interface commands are accomplished by clicking buttons with a mouse. Text is input via the keyboard for some mouse-activated commands.

4.1.3.5 Setting up the DMCC Environment

1. The configuration described below is only valid for a Sun Sparc (applies to both models 2 and 10) host computer connected via an ethernet interface to 0 - 8 Wyse X-terminals. The host is also connected to a Simnet network via an ethernet interface. See your local System Administrator to configure the network interface cards correctly.

2. The DMCC software requires the X-Window system of applications, tools and shareable libraries. This must also include the 'desktop manager' called Motif (application name is 'mwm'), and the X-Display Manager (application name is 'xdm'). See your local System Administrator to load and configure the software correctly.

3. Your System Administrator should then create a 'dmcc' account. The steps are as follows:

   a. Login as root

   b. Run 'vipw' to add a user named 'dmcc'. The entry will look like:

   dmcc::201:27:DMCC Operator Account:/a11/dmcc:/bin/csh

   Then add a user named 'oper' with root privileges:

   oper::0:26:DMCC Configuration Control Account:/a11/dmcc:/bin/csh

   c. Create the directory /a11/dmcc; IT is not important that /a11 be used, and can be tailored to your configuration if necessary.

   d. Add your site specific login files (such as .login, .cshrc, .Xdefaults); the contents of these are not important.

   e. Create the directory '~dmcc/bin'. Place the DMCC executables in this directory. Place the files '.xsession' and 'dmcc-ops' in the directory '~dmcc'. It is not important that root own all the files in this directory. Just be sure that '~dmcc/.xsession' and '~dmcc/bin/dmcc' have world access read and execute.

Note: The .xsession file contains a script read by XDM and does login procesing. For a user (login as DMCC) it will start the "dmcc" program. For the System Adminstratior (login as `oper`) it will start the script "dmcc-ops" which provides the capability to start and stop the rest of the DMCC software, and change parameters (see below).

4. Your System Administrator will now start the X-Display Manager. This can be done by either editing /etc/rc.local to start xdm on every boot, or xdm can be started manually from the root account by just typing 'xdm'. The 'xdm' Login window will then appear. The following applies to configuring the root account:

a. Make sure, before starting 'xdm', that /usr/lib/X11/xdm/Xsession (this file can also be in the directory /usr/local/X.V11R5/lib/X11/xdm) starts mwm in the background, and then starts an xterm, NOT in the background. The last process started in the Xsession file must not be run in the background.

b. If desired, put a site-specific Xsession file in the root directory for the root account (e.g.. to start other X-window applications).

5. To start the DMCC software do the following (these applications are the message server 'dms', and the network interface programs 'dmcc_sim_tx' and 'dmcc_sim_rx'):

a. In the 'xdm' Login window, enter the user name 'oper', and hit return. There is no password on this captive account, so hit enter again to get pass the password prompt. This login then runs the script ~dmcc/dmcc-ops, which first displays a menu of options.

b. The menu presented allows you to start and stop the DMCC software, or change the Zulu timezone offset, or the Simnet network interface card name (either le0 or le1, on the Sparc host, usually the le0 interface is for Simnet, and le1 is for the Xterms). Enter the number '2' at the prompt to start the software. Any 'dmcc' software still running from a previous session will be stopped by the script. When the prompt reappears, enter '1' to terminate the configuration control script and the 'xdm' Login window reappears.

c. Note that the script ~dmcc/dmcc-ops can also be run stand-alone from any root account.

6. Start the DMCC Operator interface program (this is called 'dmcc'):

a. In the 'xdm' Login window, enter the user name 'dmcc', and hit return. There is no password on this captive account, so hit enter again to get past the password prompt.

b. The 'dmcc' operator program immediately starts and displays its LOGON window. Proceed as in Section 6 of the DMCC Operations Manual.

c. If any of the DMCC software (the message server and the network interface programs) are not running or have failed, a small window will appear telling you of the problem. Advise the System Administrator of this problem. Hit the button 'okay' in the message window, and you will be logged-out.

7. To stop the DMCC software.

a. In the 'xdm' Login window, enter the user name 'oper', and hit return. There is no password on this captive account, so hit enter again to get past the password prompt. This login then runs the script ~dmcc/dmcc-ops, which first displays a menu of options.

b. Enter the number '3' at the prompt to stop the software. All DMCC software will be stopped. When the prompt reappears, enter '1' to terminate the configuration control script and the 'xdm' Login window reappears.

5 Notes

5.1 Abbreviations/Acronyms

AIRNET	AIRcraft simulation NETwork
CLI	Contract Line Item
CSCI	Computer Software Configuration Item
DMCC	Digital Message Communication Console
DMS	Digital Message Server
GMT	Greenwich Mean Time
GUI	Graphic User Interface
ICD	Interface Control Document
LHN	Long Haul Network
OSF	Open Software Foundation
ROM	Read Only Memory
SIMNET	Simulation Network
UNIX	The Unix Operating System
XDM	X-Windows Display Manager